**What is multitasking?**

Multitasking as we're studying it here involves looking at multiple media at the same time. So we're not talking about people watching the kids and cooking and stuff like that. We're talking about using information, multiple sources. And that is the part of everyone's life that's growing so rapidly,

**So is it that most people think it is possible to do two things at the same time? What do we know about that?**

We know that there are a few things humans can do at the same [time], two things at the same time our brains can do, but not any of the things we think about as multitasking. So your brain can use two words at the same time. So if someone's speaking to you, and someone else is speaking to you, we can listen to both at the same time; if you're reading and someone's talking to you. In the case of music, it's a little different. We have a special part of our brain for music, so we can listen to music while we do other things. But in general, no, our brain can't do two things at once.

**... Can't some tasks, [like breathing], be put on autopilot and others just be focused on?**

The idea of autopilot is not really precise. But there are certain tasks like physical tasks, like breathing and such, that we do without much thinking. The problem is when it comes to media, when it comes to information content, we don't have that luxury, whereas reading or listening to speech, the brain is very good at. But there's no such thing as autopilot. So for any of the tasks that we think about as part of the media landscape, no, there's no autopilot. ...

**So what's the big point here [behind your research]? ...**

The big point here is, you walk around the world, and you see people multitasking, working on tasks while watching TV, while talking with people. If they're at the computer, they're playing games and they're reading e-mail and they're on Facebook, etc. Yet classic psychology says that's impossible; no one can do that. So we're confronted with a mystery. Here are all these people doing things that psychology says is impossible. And we want to ask the question, how do they do it? Do they have some secret ingredient, some special ability that psychologists had no idea about, or what's going on?

**What are you putting them through here [in your lab]?**

What we're doing here is, we're giving them different tasks that ask about the most basic ways the brain works. We're not literally throwing them in with 10 different things at once, but to ask the question, do their brains work differently? Do high multitaskers think about information differently than low multitaskers?

**Explain to me what a high multitasker and a low multitasker is.**

We call those high multitaskers ... who are constantly using many things at one time when it comes to media. So let's say they're doing e-mail while they're chatting, while they're on Facebook, while they're reading Web sites, while they're doing all these other things. And low multitaskers are people who really are more one-at-a-time people. When they're texting, they're texting. When they're reading a Web site, they're reading a Web site. So those are the low multitaskers.

Psychologists say all of us should be low multitaskers. But obviously the world's changing, and more and more people, especially young people, but even older people, are becoming multitaskers. ...

**What are the experiments that you're doing today?**

Today we have people doing two experiments. The first one asks the question, can high and low multitaskers focus on something and not be distracted? Because one would think to multitask, you'd have to be good at ignoring distractions and going, "Oh, that's important; that's unimportant." ...

The idea we're looking at today is can high multitaskers ignore irrelevancy, which would seem to be very important. So what we do is we're going to show them red rectangles and blue rectangles, tell them all we want to know is did the red rectangles move. Ignore the blue. They're totally irrelevant. And what we want to see is if the high multitaskers can ignore them, the blue, very well, or are they suckers for looking at the blue rectangles.

**What about the other experiment?**

The other experiment has to do with the idea of shifting from one task to another. In fact, that's where the term "multitasking" comes from. So what we're doing here is we're telling people, we're going to either show you the word "letter" or "number" and then show you a letter and number. And if you see the word "letter," press this letter if it's a vowel and this one if it's a consonant. If you see the word "number," press this one if it's even and this one if it's odd. And the idea is to see when people have to switch from looking at the number to looking at the letter, how fast are they? Are high multitaskers fast multitaskers? Or are they in some sense slower, crippled by having to switch from task to task?

**What did you expect when you started these experiments?**

Each of the three researchers on this project thought that ... high multitaskers [would be] great at something, although each of us bet on a different thing.

I bet on filtering. I thought, those guys are going to be experts at getting rid of irrelevancy. My second colleague, Eyal Ophir, thought it was going to be the ability to switch from one task to another. And the third of us looked at a third task that we're not running today, which has to do with keeping memory neatly organized. So we each had our own bets, but we all bet high multitaskers were going to be stars at something.

**And what did you find out?**

We were absolutely shocked. We all lost our bets. It turns out multitaskers are terrible at every aspect of multitasking. They're terrible at ignoring irrelevant information; they're terrible at keeping information in their head nicely and neatly organized; and they're terrible at switching from one task to another.

**So what do you make of that?**

... We're troubled, because if you think about it, if on the one hand multitasking is growing not only across time, but in younger and younger kids we're observing high levels of multitasking, if that is causing them to be worse at these fundamental abilities -- I mean, think about it: Ignoring irrelevancy -- that seems pretty darn important. Keeping your memory in your head nicely and neatly organized -- that's got to be good. And being able to go from one thing to another? Boy, if you're bad at all of those, life looks pretty difficult.

And in fact, we're starting to see some higher-level effects [of multitasking]. For example, recent work we've done suggests we're worse at analytic reasoning, which of course is extremely valuable for school, for life, etc. So we're very troubled about, on the one hand, the growth, and on the other hand, the essential incompetence or failure. ...

One would think that if people were bad at multitasking, they would stop. However, when we talk with the multitaskers, they seem to think they're great at it and seem totally unfazed and totally able to do more and more and more. We worry about it, because as people become more and more multitaskers, as more and more people -- not just young kids, which we're seeing a great deal of, but even in the workplace, people being forced to multitask, we worry that it may be creating people who are unable to think well and clearly.

**... Are there certain kinds of thought that suffer more than others?**

It's a great question. The answer is yes. So we know, for example, that people's ability to ignore irrelevancy -- multitaskers love irrelevancy. They get distracted constantly. Multitaskers are very disorganized in keeping their memory going so that we think of them as filing cabinets in the brain where papers are flying everywhere and disorganized, much like my office.

And then we have them being worse at switching from one task to another. ... It's very troubling. And we have not yet found something that they're definitely better at than people who don't multitask.

**How solid is your data? How confident are you about it?**

We're pretty carefully doing our statistical analysis, so we're very confident in the results.

We're of course doing much larger studies. Historically, psychology studies start small. We've done a variety of different tests, which gives us more confidence, versus doing just one experiment, then saying, "Aha!" ... We'll be putting people in fMRIs [functional Magnetic Resonance Imaging] ... to look at what parts of the brain multitaskers and non-multitaskers are using. So we're very confident now, and we'll certainly be gathering more data.

**Explain to me the fMRI that you're going to be doing.**

This is probably better explained by Anthony Wagner, [researcher at the Stanford Memory Laboratory and associate professor in the Department of Psychology and Neuroscience Program]. But basically the ideas are, our brain is divided into pieces, with different pieces doing different things. So the question is, when I confront you with something, what parts of your brain does your brain decide to use?

So, for example, if I present you with a lot of potentially irrelevant information, some people go for it, just say, "Oh, more, more, more, more, more!" Others say: "No, I'd like to work with what I've got. That's what I want to focus on." That would be indicated by different parts of the brain lighting up or not, and that's what we're trying to see.

**So what are the potential outcomes of what you're doing later today?**

The potential outcome of the fMRI is to start to ask the question, is it nurture or nature? Are people born multitaskers, or are they made multitaskers?

Now, if they're born multitaskers, we can say to them, "You know, you shouldn't multitask because you're going to be bad at it." But if they're made multitaskers, and we're in a world where multitasking is being pushed on more and more people, we could be essentially undermining the thinking ability of our society. ...

And frankly, we're seeing this across the world, from the least developed countries to the most developed countries. Multitasking is one of the most dominant trends in the use of media, so we could be essentially dumbing down the world.

**That's a terrifying thought.**

It's very scary. And it's one of the reasons we're so excited about this research and why so many other people are getting excited.

People never bothered to look at what we call chronic multitaskers. What they would do is they'd make people do five things at once and say: "Ha ha! They're not as good as if they do one thing at a time." Not a big shock, I think. What we decided to do is ask the question, what's happening if you're doing this all the time, even when you're not multitasking? So if we take a multitasker and say, "Now just focus on this," can they? As a professor and as a teacher, we think a lot about how do you teach kids who can't pay attention or are distracted by irrelevancy or don't keep their memory neatly organized? It's a scary, scary thought.

And, in fact, you already hear professors and others talking about changes in the way kids write, so that instead of writing an essay, they write in paragraphs, because what happens is, they write a paragraph, and they say, "Oh, now I'll look at Facebook for a while." Or they write a paragraph and say, "Oh, chance to play poker," or whatever other activity they want, or to do all of these at once.

So what we're seeing is less of a notion of a big idea carried through and much more little bursts and snippets. And we see that across media, across film, across, in Web sites, this idea of just do a little bit and then you can run away.

**We were at MIT, and we were interviewing students and professors. And the professors, by and large, were complaining that their students were losing focus because they were on their laptops during class, and the kids just all insisted that they were really able to manage all that media and still pay attention to what was important in class -- pick and choose, as they put it. Does that sound familiar to you?**

It's extremely familiar. ... And the truth is, virtually all multitaskers think they are brilliant at multitasking. And one of the big new items here, and one of the big discoveries is, you know what? You're really lousy at it. And even though I'm at the university and tell my students this, they say: "Oh, yeah, yeah. But not me! I can handle it. I can manage all these," which is, of course, a normal human impulse. So it's actually very scary. ...

**So who are these kids that you picked [for your study] to come in here today?**

We picked the kids at Stanford who are multitasking a whole lot. So on a college campus, most kids are doing two things at once, maybe three things at once. These are kids who are doing five, six or more things at once, all the time.

So they're the kids who are texting while talking with people, while working on their papers, while chatting on multiple sessions. They're the kids who are playing multiple games on their screen while they're doing Facebook, while they're talking, while they're doing all these other things. So these are the extreme kids, the kids who are at the very, very high end of that. ...

**And do these kids think they're pretty good at it?**

Yeah. They all seem to think they're really good at it. In fact, what's ironic is when we talk with people who multitask all the time, those who don't -- even though our research suggests the ones who don't would actually be better at it -- they're the ones who are sure they're really bad at it. And the ones who do it all the time and are sure they are great at it are really bad at it. So it's a real question: What's going on?

**I know with myself that I've started multitasking much, much more. And it's not that I necessarily think that I'm good at it, but ... my sense is that I can function in a world in which I have to multitask. But I recently had myself analyzed by an interruption scientist. ... She watched me for a whole day, and she said that at the end of the day, I hadn't spent more than three minutes on a single task, and that really chilled me.**

It should be chilling. Our brains aren't really built for that. We evolved in a world in which there [were] very few things to look at at one time, or, more precisely, very few things that weren't related. So if you were out hunting an animal, yeah, you might look at a lot of things, but they were all about hunting that animal. Now what we see is people trying to use information in a totally unrelated way. And that's not how your brain, or anyone's brain, is built.

**So what gets lost?**

Some things that we know get lost are, first of all, anytime you switch from one task to another, there's something called the "task switch cost," which basically, imagine, is I've got to turn off this part of the brain and turn on this part of the brain. And it's not free; it takes time. So one thing that you lose is time.

A second thing you lose is when you're looking at unrelated things, our brains are built to relate things, so we have to work very, very hard when we go from one thing to another, going: "No, not the same! Not the same! Stop it! Stop it!" It's why people who aren't multitaskers, like me, often experience when we're typing and someone walks up and starts talking with you -- you've probably had this -- you start typing their words and go, "Ah, what happened?" And that's because your brain loves to mix. So we're spending a lot of time trying to beat down this combining brain we have. ...

At the end of the day, it seems like it's affecting things like ability to remember long term, ability to handle analytic reasoning, ability to switch properly, etc., if this stuff is, again, ... trained rather than inborn. If it's inborn, what we're losing is the ability to do a lot of things that we're doing. We're doing things much, much poorer and less efficiently in time. So it's actually costing us time.

One of the biggest delusions we hear from students is, "I do five things at once because I don't have time to do them one at a time." And that turns out to be false. That is to say, they would actually be quicker if they did one thing, then the next thing, then the next. It may not be as fun, but they'd be more efficient.

**You're confident of that?**

Yes. There's lots and lots of evidence. And that's just not our work. The demonstration that when you ask people to do two things at once they're less efficient has been demonstrated over and over and over. No one talks about it -- I don't know why -- but in fact there's no contradictory evidence to this for about the last 15, 20 years. Everything [as] simple as the little feed at the bottom of a news show, the little text, studies have shown that that distracts people. They remember both less. Studies on asking people to read something and at the same time listen to something show those effects. So there's really, in some sense, no surprise there. There's denial, but there's no surprise.

The surprise here is that what happens when you chronically multitask, you're multitasking all the time, and then you don't multitask, what we're finding is people are not turning off the multitasking switch in their [brain] -- we think there's a switch in the brain; we don't know for sure -- that says: "Stop using the things I do with multitasking. Focus. Be organized. Don't switch. Don't waste energy switching." And that doesn't seem to be turned off in people who multitask all the time.

**So are you suggesting that by multitasking all the time, we are actually changing our brains and making our brains worse at focusing on one thing?**

There's a good chance. We don't know for sure, because it also could be that people are born to multitask. That is, they're born with the desire to do all these things, and that's making them worse. But there is reason to worry at least, and believe that.

One of the other worries is, we're seeing multitasking younger and younger and younger. So in a lovely study, someone showed that when infants were breastfeeding and the television was on, infants were doing a lot of television watching. Now, if we think about it, the way that we think that breastfeeding evolved the way it did is the distance from the mother's face to the infant is the perfect focal distance. The voice is one that's very attractive.

Well, if you think about it, what is television filled with? Faces and voices. What do babies love? Faces and voices. So now, at a time when we believe that children learn intense concentration, they're being drawn away. Then as they get older, as they get to 3 or 4, we started feeling guilty that we put kids in front of the TV as a baby-sitter. So what did we do? We didn't turn off the TV. We started giving them toys, books, etc., while they're watching TV. So what are we telling them? We're telling them, "Don't pay attention; do many things at once." Well, it may not then be surprising that years later, that's how they view the media world. ...

**So is there any movement to stop all this multitasking?**

Oddly enough, we see the opposite. We see a number of societal forces encouraging multitasking. So in a lot of workplaces we see people being told, "You must answer e-mail within 15 minutes." Well, that means you're stopping what you're doing. Or, "You must keep your chat windows open."

Among software, how many new apps are there every single day on the iPhone, on the Android? How many new YouTube videos are there? How often does Facebook change? So, if anything, cultural forces and the expectation that people will respond instantly and chat and talk and do all these things all at once means, frankly, all the pressure is going that way.

We are seeing some rebellion. So, for example, [there are] companies, you know, calling me and saying, "How can we stop this? Our workforce is being driven crazy," or teachers trying desperately -- mostly failing -- to control the level of multitasking in the classroom. But it seems like mostly a losing battle.

**It's disturbing.**

It is scary. And it changes. We don't know how to teach to multitaskers. We don't know how to design software for multitaskers. We don't know how to have conversations effectively with multitaskers. So we're utterly unprepared for a world we're being thrust into. ...

**How much research is there on [multitasking]? How much do we know about it? Why are you the only guy that we found who's really doing this kind of work? ...**

No one expected multitasking to take off as fast as it did, and I think most academics, myself included, kept on seeing it as an aberration, because it was impossible. So you'd see someone multitasking and go, "Ha ha ha, those wacky college kids," you know, that we all sort of laugh at for one reason or another. OK, they'll grow out of it. And then you start looking around and go, "Wait a minute; they're growing into it, not out of it." Little kids are growing up with it. Older people are being stuck with it. And all of a sudden you go, "Oh, my gosh." So it's become a frantic thing.

The one other domain, of course, is cars. So all of a sudden we have drivers with the idea they can multitask: more and more screens in the car; more voices in the car; more functions in the car; texting obviously a huge issue, and talking in the car. And once again, what do you hear people say? "Oh, I can talk in the car. I can talk while I drive, no problem at all. Speak on the cell phone, doesn't affect me a bit." Yet the results are unambiguous and clear.

And even weirder is texting. So once someone came to me and said, "Why haven't people researched texting and driving?" So I said, "OK, imagine I go to the National Science Foundation and say: 'Hmm, people have to do this thing called driving, which requires your hands and your eyes, and there's this other thing they do called texting, that requires their hands and their eyes. I wonder if it affects them.'" I said, "I'd be thrown out of the room!" It would be ludicrous!

So part of it is it's so obvious in these cases that no one would ever think you could do it. But again, the culture has changed, and this faith in our ability to manage information just because it's there is really startling from a cultural point of view.

**Absolutely. What about gender and age differences?**

Well, gender ... was a surprise. ... There's a lot of research on what we call physical multitasking, the ability to manage multiple physical things at the [same] time, so the classic example would be watching the kids while cooking, while cleaning, etc. And in those domains, lots and lots of research over a number of years has shown women are better. And there are evolutionary explanations for that, etc. So we expected, surely we'd see the same thing for multitasking. We actually see no gender difference whatsoever, which was very surprising. ...

So what we think is that the human brain of men and women is built different for the physical world but the same for the information world. And that's not surprising, because the physical world, evolution happened a long time [ago]. We didn't evolve to 20th- and 21st-century media, right? So the idea of lots of media at once -- I even tell my students, you know: "I would have loved to multitask as a kid. We had nothing to use!" You know, I could read two books at once, I guess, but basically, we didn't have any of this stuff, so I think that's a large part of it, too.

**What about the notion that kids, because they've learned how to multitask for longer, are better at it than people like you and I?**

We expected that, and we hope that. There are some colleagues who are looking at kids and children and development. One of the things we're seeing important for kids is -- already mentioned it -- very young age groups, infants watching TV ... and doing a bunch of other tasks.

But what we're also seeing is, in younger and younger ages, social relationships occurring online rather than face to face, and all the classical theories of developmental psychology worked on the assumption that kids would interact with other kids, and you learned everything from that -- everything from moral development to your identity to whatever. We're seeing incredible growth in social multitasking among younger and younger kids. We're talking third grade, fourth grade. As soon as they can write, one of the first things they're writing is social communication, not reading books. So now all of a sudden, we're changing that, too.

Of course the advantage is, it's hard for me to navigate talking with two people at once. But on the Web, I can easily talk with -- well, not easily [for me] -- I can talk with four people at once. I can have four different conversations at the same time. So we don't know at all -- and again, it's scary just because we don't know -- how are their brains changing. How is the whole nature of social life [changing] because of multitasking?

One of the biggest points here I think is, when I grew up, the greatest gift you could give someone was attention, and the best way to insult someone was to ignore them. ... The greatest gift was attention. Well, if we're in a society where the notion of attention as important is breaking apart, what now is the relationship glue between us? Because it's always been attention.

**What is it [now]? Do you have any theories?**

No. None at all, and it's scary, because this seems to be an inexorable trend.